

Kaira Rysdam
Crystal Unit

Science Experiment: Salt Crystals



Grade: 4th

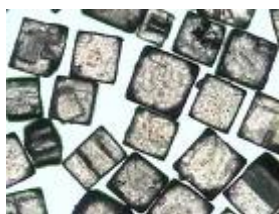
CCG: SC.04.SI.04 Use the data collected from an investigation to explain the results.

Foundation: Analyzing and interpreting results. Analyze scientific information to develop and present conclusions.

Specific Purpose: Students will learn the process of salt granules joining together to form a large version of a salt crystal. Students will also learn that when a liquid (Mrs. Stewart's liquid bluing) evaporates it causes the salt crystals to form.

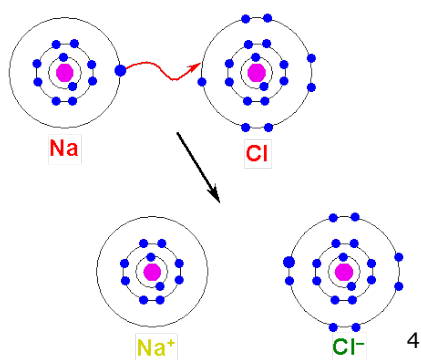
Background:

A crystal is a solid that includes an organized grouping of atoms or molecules into a regular, repeating pattern extending in three dimensions. Crystals include things such as diamonds and rubies, and also salt and sugar. Every crystal has different properties and a different shape, for example, salt crystals are in a cube form, whereas a sugar crystal is oblong and slanted at the ends.¹

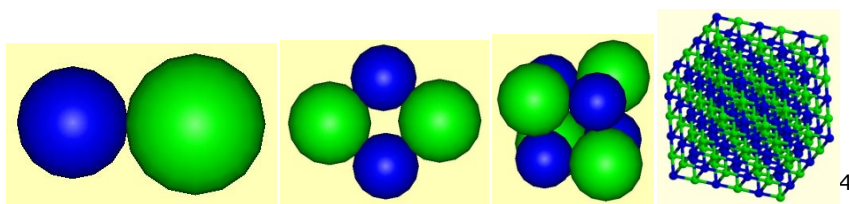


Common salt is the chemical compound sodium chloride (NaCl). It is approximately 60 percent chlorine and 40 percent sodium. Salt is a mineral that occurs in many parts of the world, to include salt lakes, where it is often a mixed evaporate, seawater, sediment layers, and even on the planet mars.² Sodium chloride occurs in the form of a crystal, consisting of tightly bound cubes held together via ionic bonds. An atom of sodium has one electron in its outer shell, and chlorine lacks one electron to fill its shell, therefore, it is favorable for them to bond together.³ Sodium loses an electron, making it Na^+ and chlorine gains an electron, making it Cl^- , which make these elements attracted to one another. The stable form of sodium chloride involves a very large number of NaCl units, forming a lattice or crystal structure.⁴ Salt varies in color from pure salt being colorless, to white, gray, or brown, when not pure.² Experiments such as the one conducted, demonstrates how to grow salt crystals. Table salt is the main ingredient used, which is made up of fine granules. The included ingredients (bluing, ammonia, and food coloring) help to disrupt the ionic bonds and allow the salt to reform in a new crystalline structure.

For the lesson, the formation of an ionic bond should be discussed with the students. Images will help to demonstrate the transfer of electrons and resulting charges, as shown here.⁴



These images demonstrate the formation of a salt crystal. There is an initial ionic bond of one sodium element with a chloride, followed by continuous bonds to form a more stable crystal structure.⁴



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Assessment: Each student will bring up their small tray (pie tin) and explain their experiment to the class. With their experiment they will also have a data log chart. This log will include what materials they used, and it will also include a progress explanation for each day of the crystal process, from the first day to the last day of the experiment. The student will also add any other method to track their observations, such as drawings of the crystals or measurements. This way the teacher can track the student's observations and find what vocabulary (scientific) each student was able to retain and use correctly: such as hypothesis, data, observation, molecules, and each chemical name. This gives the teacher an idea of the student's physical and mental understanding of the salt crystal experiment.

Materials Needed: pie tray, Vaseline or oil, charcoal briquettes or sponge, string, 90ml salt, 90ml Mrs. Stewart's Bluing, 15ml household ammonia, and food coloring.

Getting started: This lesson should be incorporated with some sort of crystal lesson unit. Because this experiment involves the formation of salt crystals, perhaps there could be a lesson on the sea and lakes like the Great Salt Lake or Dead Sea to demonstrate the formation of salt crystals in nature. Once evaporation takes place in these areas, some of the salt cannot be retained with the evaporating water, and salt crystals form. Prior to the beginning of the experiment the teacher will assure that the students understand the basics of a crystal, understand the vocabulary words, and the basics of experimentation.

To begin the teacher will need to lay out all of the ingredients needed to construct this lesson, as listed in the materials section. The teacher will then demonstrate the experiment by making his/her own crystal solution. The teacher will instruct the students to choose the coal, sponge, or string to use as their rough surface that their crystal molecules will use to bind to and form a larger crystal. The teacher will also explain how to put together a learning log to stress the importance of keeping descriptive data. The

teacher will then release the students to put together their very own crystal garden.

Summary of Lesson: Students will put together their crystal gardens. The directions will be posted on the ELMO just in case the students forget the steps of the correct measurements of the house hold ingredients. Students will also put together a functional data/learning log. For this lesson, observations will be over the duration of a week, so again I stress that this lesson be incorporated with a "crystal" unit of some kind. During the weeks time the students will be given the option to add more ammonia or bluing to their crystal garden if they chose (this is an option). By allowing each of the students to be in control of their experiment it will create individuality in the experiments between students. The students will have to think harder and it will also provide a wide range of different data/learning logs.

Closure: On the last day of the unit/crystal experiment the students will be given the assessment (listed above). This gives them a chance to show each of their fellow classmates their crystals. Each student's crystals will vary from each other (shapes, color, texture, location, etc).

Reflection: After each student has shared their crystal garden, we will gather in a group and talk about our "individual" time/behavior management. We will also talk about the idea of doing another individual based experiment. If they want to do another experiment or if they do not want to and why?

Meeting all learners' needs: This activity can be done with the help of an assistant, and the students that are considered SPED can have the opportunity to work with a partner (Teacher will give the appropriate partners).

Vocabulary Words:

Experiment: A method to investigate particular types of research questions or solving problems.

Hypothesis:

Data:

Observation:

Molecule:

Chemical name:

Crystal: a clear, transparent mineral or glass resembling ice. A solid with a repeating, three dimensional pattern of atoms, ions or molecules with fixed distances between parts.

Crystallization: Process of forming solid crystals.

Solution: homogenous mixture of two or more substances.

Solute: dissolved into the solvent. I.e. salt.

Solvent: dissolves the solute. i.e. water.

Ionic Bond: a bond formed from the attraction of two oppositely formed ions.

Ions: an atom or molecule with a positive or negative charge.

Water Molecule: Water is a chemical substance with chemical formula H_2O : 2 hydrogen atoms covalently bonded to a hydrogen atom.

Covalent bond: chemical bonding by the sharing of electrons between atoms.

EXAMPLE DATA LOG

Materials:

Progress: (include description with vocabulary words, measurements, drawing, any additional ingredients added and any other method you wish)

Day 1:

Additional Materials:

Day 2:

Additional Materials:

References:

1. Science Kids at Home. What are crystals.
http://www.sciencekidsathome.com/science_topics/what_are_crystals.html#more Retrieved 25 August 2008.
2. Salt Institute. What is salt? <http://www.saltinstitute.org/15.html>
Retrieved 25 August 2008.
3. Hyperphysics. Sodium Chloride, NaCl. <http://hyperphysics.phy-astr.gsu.edu/hbase/molecule/nacl.html> Retrieved 25 August 2008.
4. No author. Structure and bonding in chemistry: ionic bonds.
[Http://www.chm.bris.ac.uk/pt/Harvey/gcse/ionic.html](http://www.chm.bris.ac.uk/pt/Harvey/gcse/ionic.html). Retrieved 25 August 2008.

Information on experiment was retrieved from Mrs. Stuarts Bluing bottle.